Duration Models: An Analysis of Unemployment Spells in Macedonia

By

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Abstract

The aim of the thesis is to look qualitatively and empirically at the reasons for high unemployment spells in Macedonia. The thesis focuses on the effect of education on the probability that unemployment spells will end and the regional characteristics of the unemployment duration. The thesis opens with qualitative-quantitative analysis of the labor market in Macedonia that looks at the main features of unemployment and its duration. Empirically unemployment spells are examined using Kaplan-Meier and Cox's duration models. The probability of exiting unemployment through finding a job is estimated as a function of education, sex, age and geographical region. The analysis is based on data obtained from the Employment Agency of the Republic of Macedonia, which includes observations within the period January 1st, 2002 to December 31st, 2005. To great extent the results coincide with the anticipated findings for transition economies. However, the features of the regional unemployment are country specific.

Key words: unemployment spell, education, geographical region, Kaplan-Meier, Cox model

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1. Introduction

The Republic of Macedonia is one of the countries with the highest rates of unemployment in Europe. The national labor market is characterized by extremely low employment and very high unemployment. According to data from the National Statistical Office in the third quarter of 2009, the overall employment rate was only 39.3 % in comparison to 64.6 % in the European Union (EU). The unemployment rate of 32.2% of the active population is significantly higher than the EU average of 8.3% (2009).

The structural imbalances of the supply and the demand side of the labor market and the poor economic condition have been the main contributory factors to the high degree of unemployment. In this thesis, I focus on the determinants of long unemployment spells[1] in Macedonia. Previous research suggests that education; the region where the unemployed lives; as well as age and gender can be significant determinants for the duration of the unemployment spell. Other important determinants can be the length of the unemployment benefits, the Labor Market Programs (LMP) and so on.

Taking into account that the nature of this study is mainly exploratory, either a quantitative; qualitative and empirical method could be inadequate on its own. Considering what information can be culled from the best available data for the empirical analysis the main focus of the thesis is to evaluate the effect of education; region and age on unemployment. That is, their effect on the probability that unemployment will end in the next short period. The next paragraphs provide brief review of the literature that looks at regional unemployment and education as significant determinant of the length of unemployment.

[1] The term spell is used throughout the thesis for the duration variables.

There exists consensus in the literature that reducing regional unemployment is beneficial for the country as it goes in hand with higher national output and lower inflation (Taylor 1996). Thus understanding the regional patterns is important.

In the literature there are many studies that look at the regional disparities on the labor market and in particular at the differences in employment and unemployment rates across regions. Stylized facts show that regional unemployment differs across countries. It is found that U.S and European countries differ significantly. According to Blanchard and Katz (1992) U.S markets are more responsive to differences that appear across regions and these differences are not so persistent. On the other hand, for regional unemployment in Europe there exists long-term differences in unemployment rates across regions that to a great extent can be attributed to the inflexibility of the labor markets and the low labor mobility (Bertola, 2000).

While evidence for the New Member States (NMS) in the European Union and transition countries is restricted to a small number of studies, evidence for Western European Countries is more widely available. For instance, empirical analysis for the regional policy in the UK can be found in Taylor and Wren (1997). Chapman (1991) and Martin (1997) have also provided empirical evidence for the regional unemployment differences in U.K. Further evidence can be found in Mertens and Haas (2005) and Pehkonen and Tervo (1998) that look at the differences in regional unemployment across East and West regions in Germany and Finland respectively.

There are naturally, big differences between the NMS and Western European countries. Römisch and Ward (2005) analyze the differences between regions within the new member states in the EU in terms of economic performance and employment. The findings show that the employment rate in agricultural regions of all NMS, besides Romania, is higher than the average for regions in which the capital city is located. The lowest rate of

employment is found in basic service regions (Römisch, and Ward, 2005). Basic services are all services without the financial and banking service sector. According to the findings the low employment in these regions is due to the fact that even though rural in nature, they have relatively low employment in agriculture (Römisch and Ward, 2005).

Landesmann and Romisch (2006) investigate differences in employment rates within the EU-27 by types of region. They found that the capital city regions of the NMS have higher growth in the employment rates in comparison to the national average. In addition, such growth patterns have also been experienced by the Southern EU-15 capital cities. The increase in employment rates in the NMS capital city regions was attributable to the population decrease (Landesmann and Romisch, 2006).

Even though the number of studies that look at regional unemployment in transition countries is limited, the interest for research related to these economies is growing in the last years. Feragina and Pastore study regional unemployment in Poland and, according to them, in the case of Poland and in general for transition countries the persistence of the regional differences is attributed to two main sources. Firstly regional differences in unemployment are not simply related to income. They are found to be strongly correlated to the degree of industrial restructuring. Secondly, regional differences in unemployment rates are found to be the result of the differing speeds of restructuring within the country (Feragina and Pastore, 2008). Huber (2007) also studies the trends in regional labor market disparities for transition countries. He finds that transition is associated with increased regional disparities and processes that have a negative effect on the labor market. In his study it is found that capital cities and regions closer to EU borders have lower unemployment rates during transition, but cities around the capital have not profited. In addition, Huber discussed that it is unlikely to hope that migration and wage flexibility can serve as a labor market adjustment mechanism that will reduce regional differences. The labor markets in EU are criticized for not being

flexible and mobile enough in comparison to U.S. The study finds that mobility in transition economies is even lower compared to the EU-15 (Huber, 2007).

Bornhorst and Commander (2006) consider regional differences in unemployment rates for six transition economies from Central and Eastern Europe (CEE). They find that regional differences emerged at the beginning of the transition process and have been highly persistent over time. Other studies that look empirically at the differences of the unemployment across regions in transition countries include Badulescu (2004) and Borshich (2008). They look at the regional patterns of unemployment in Romania and Slovenia, respectively.

Within Macedonia there are significant differences in economic activity and GDP across regions. These differences have become more pronounced in the last decade, as the concentration of industries has moved in the capital of Macedonia, Skopje. Since there are disparities in the economic activity one would expect such differences to be reflected across the regions in the labor market too. Thus, it is relevant to understand the regional unemployment. Understanding regional unemployment spells will be relevant for future studies of the labor market in Macedonia, that will aim to model the labor market mechanism in relation to wage flexibility and migration patterns. Moreover, understanding the size and patterns of the regional disparities is important for further policy intervention.

The current thesis further considers the educational composition of unemployment in Macedonia. There exist consensus in the literature that one more year of education will be translated into better labor market prospects; shorter time needed for finding a job and higher wage. According to the basic labour search models surveyed by Rogerson, Shimer, and Wright (2005), more years of schooling affects unemployment through two main channels. Higher education is associated with gaining more qualifications, thus increasing the number of available job offers and decreasing unemployment duration. At the same time, however,

labour market participants with higher education levels have higher reservation wages, which may increase the duration of the unemployment spell. The authors conclude that the overall effect of human capital on unemployment duration depends on which of these two effects dominate (Rogerson et al., 2005).

There are many studies that look at the effect of education on the duration of the unemployment spells, which consider many different countries. Most of these studies confirm the dominance of the positive effect of education on decreasing the unemployment spell. Evidence from Dutch panel data over the period 1980-94, for example, suggests that the least educated employees have a higher risk of becoming unemployed than workers with higher education (Wolbers 2000). A review of school to work transitions in OECD countries, prepared by Ryan (2001), also confirms the positive effect of education on reducing the duration of being unemployed. Similar evidence comes from the studies of Russell and O'Connell (2001), Bowers et al. (1999) and Lerman (2000), who consider nine European countries, OECD countries and the United States respectively. According to study made by Human Resources Development Canada (HRCD, 1997) the major trends in the labour market in Canada also confirm the positive effect of education on labour markets prospects, as does the available evidence for Australia (Hunter, 1996 and 1997).

Overall, all these studies indicate that in the short term as well as in long terms, the positive effect of education is dominant and that individuals with higher education need less time to find a job even though they have higher reservation wage. Thus, it can be anticipated to see similar findings for the labour market in Macedonia. That is, is expected to find that low levels of educational attainment increase the risk of poor labour market prospects.

The duration of the unemployment spells and the effects of regional differences and education can be empirically modeled by different techniques. There are many empirical

studies that apply duration model. Green and Riddell (1995) identify the effect of the Canadian unemployment insurance system on employment duration by comparing the hazard rate out of employment for the experimental year with that for regions where the unemployment insurance system was not changed. Tansel and Tasci (2005) are using parametric and non-parametric duration models to estimate the probability to enter and exit unemployment in Turkey. They find that age has negative effects on the probability of exiting unemployment. Similar findings are evident for the Swedish market according to Nivorzhkin (2005). He used a competing risk duration model to find that older workers have longer unemployment spells. A negative association between age and the probability of reemployment was also established by Kupets (2006) for Ukraine, while the results of D'Agostino and Mealli (2000) provide mixed results. In this latter study the determinants of short unemployment spells in nine EU-15 members are examined using duration models. The exit from unemployment to employment is modeled using survival analysis, by means of flexible duration models. Arranz and Romero (2003) find that traditional duration models and extra time duration models can lead to different empirical findings. They apply these models to study the effect of unemployment benefits on hazard rates in Spain. Newell and Pastore (2006) study regional unemployment in Poland using Cox's (1972) semi-parametric procedure to estimate the outflow from employment to unemployment in different regions. Van den Berg *et al*. (2008) examined the exit from unemployment to employment and to nonparticipation in the French labor market by applying dependent competing risk model with a nonparametric specification. The results from the study suggest that the unemployment spell for women is longer compared to men. Similar gender disparities in unemployment duration were found by Gonzalo and Saarela (2000). Kupets (2006) applied a Cox proportional hazard model with two competing risks to analyze the main determinants of the duration of unemployment spells in the Ukraine. The findings from this study show that

age, marital status, income during unemployment and local demand constraints significantly affect the duration of unemployment.

To my knowledge even though Macedonia is the country with the second largest unemployment rate in Europe and it has been used as an outlier when looking at the unemployment rates in the Eastern Europe Central Asia (ECA) region (World Bank, 2005a) the number of studies that look at the unemployment is limited. Kjosev (2007) and Nikolovska and Kjosev (2002) give overview of the labor market and present policy measures needed to combat unemployment. Further studies for the labor market are prepared by the World Bank(2003; 2005a; 2005b; 2008).

This thesis adds to the literature on unemployment duration by considering the determinants of unemployment duration for Macedonia using a combination of qualitative and empirical analysis. Contributions can be elaborated into two levels. At the empirical level this thesis will provide evidence for the labor market in Macedonia. It will assess the probability of finding a job with regard to education, region, age and sex. It also can serve as guidance to similar transition economies. At this level, the study as well revisit three different duration models and determines the benefits and the limitation of each. At the policy level, this research enables the mapping of important policy implications such as the optimal Active Labor Market Program ALMP design or the optimal length of unemployment benefits within a country. The evidence can be relevant from other transition economies in South Eastern Europe (SEE).

The remainder of this thesis is structured as follows. In the second section is given an overview of the characteristics of basic labor market indicators in Macedonia. This section provides qualitative and quantitative analysis of the characteristics of the unemployment rate and the unemployment spell, providing important stylized facts by gender, regional and

educational differences. The following section describes the dataset from the Employment Agency of Macedonia that is used for the empirical analysis. This section addresses the limitations of the available dataset. In section four that deals with the methodology are introduced the duration models since they are the most appropriate models to evaluate the research question. In particular, this section describes how survival analysis is applied to the problem of unemployment, with both the parametric (Kaplan-Meier) the non-parametric and the semi-parametric (Cox) duration models being described. This section summarizes the potential issues that can arise from each duration model and based on this analysis is grounded the decisions which models to be used for the estimations. In the fifth section the results are reported and described. It is found that education has a positive effect on reducing the length of unemployment spells, and that labor participants living in Eastern parts need the least time to exit unemployment. The impact of age and gender is not found to be very pronounced. The last sixth section concludes.

2. The Labor Market in Macedonia

In Macedonia official statistical data for the labor market is obtained from the National Employment Agency and from the Labor Force Survey conducted by the State Statistical Office (SSO). In this research project data from the Labor Force survey and from the Employment Agency are used for the qualitative and the empirical analysis respectively. The definitions for the terms Working Age Population (WAP); Labor Force (LF); Employed(E); Unemployed; Active population rate; can be found in Table A 1. in the appendix.

The basic indicators in Table 1. show the active participation, the employment and unemployment rates over the period 1996 to 2009. The source is the Labor Force Survey (LFS) of the State Statistical Office (SSO). The LFS is a survey developed in accordance to the standards of the International Labor Organization (ILO) that provides information on the characteristics of the active labor population in Macedonia. The first LFS in Macedonia was published in 1996. The last yearly survey is for 2009, while the last quarterly publication is for the fourth quarter of 2010. The main categories that are used to describe the active population are employment, unemployment, demographic variables, educational levels, gender, ethnic group and other characteristics of the individual. The information is limited. The SSO does not keep records for the individuals' wage levels; the participation of unemployed in Active Labor Market Programs (ALMP); the exact transition from unemployment and so on. This is something that needs to be considered in order to combat unemployment is important to understand the effectiveness of ALMPs; and look at labor mobility and the overall flexibility of the labor market.

From table 1 we can observe that the unemployment rate declined from 1997 to 2001, and then increased again until 2005. There has been some improvement in labor market

indicators over the period 2005-2009. The active participation rate – despite being consistently low was growing in the latter period from 52.2% in 2004 to 56.7% in 2009. Significant growth in the participation rate is also seen in 2001, which is explained by the high employment of reservists due to the war conflict in 2001. The participation rate in Macedonia is lower than the average rate for the Eastern Europe Central Asia (ECA) region. Participation rates differ among gender, region and age groups. There is big gap between the active male and female population as can be seen from tables 2 and 3. The low participation rate of females is driven by the low percentage of active rural – unskilled – women.

Table 1. Basic Labor Market Indicators in Macedonia: 1996-2009

Year	Activity Rate	Employment Rate	Unemployment Rate
1996	54,9	37,42	31,9
1997	53,7	34,39	36
1998	54,8	35,9	34,5
1999	53,1	35,91	32,4
2000	53	35,84	32,3
2001	55,5	38,56	30,5
2002	52,64	35,82	31,94
2003	54,51	34,51	36,69
2004	52,2	32,8	37,16
2005	54,51	34,51	36,69
2006	55,1	35,9	36
2007	55,7	36,2	34,9
2008	56,3	37,3	33,8
2009	56,7	38,4	32,2

Source: State Statistical Office (SSO) of Macedonia

Table 2. Basic Labor Indicators by Gender: Male

Year	Working age	Employed	Unemployed	Labor force	Participation rate	Employment rate	Unemployment rate
2000	780592	339550	148994	488544	62,59%	43,50%	30,50%
2001	772058	357266	149372	506638	65,62%	46,27%	29,48%
2002	788189	342779	159144	501923	63,68%	43,49%	31,71%
2003	791700	327300	191900	519200	65,58%	41,34%	36,96%
2004	798134	320640	186223	506863	63,51%	40,17%	36,74%
2005	806621	332179	191096	523275	64,87%	41,18%	36,52%
2006	808522	351974	191856	543830	67,26%	43,53%	35,28%
2007	814601	358835	189306	548141	67,29%	44,05%	34,54%
2008	916772	373483	188222	561705	61,27%	40,74%	33,51%

Sorce: SSO of Macedonia

Table 3. Basic Labor Indicators by Gender: Female

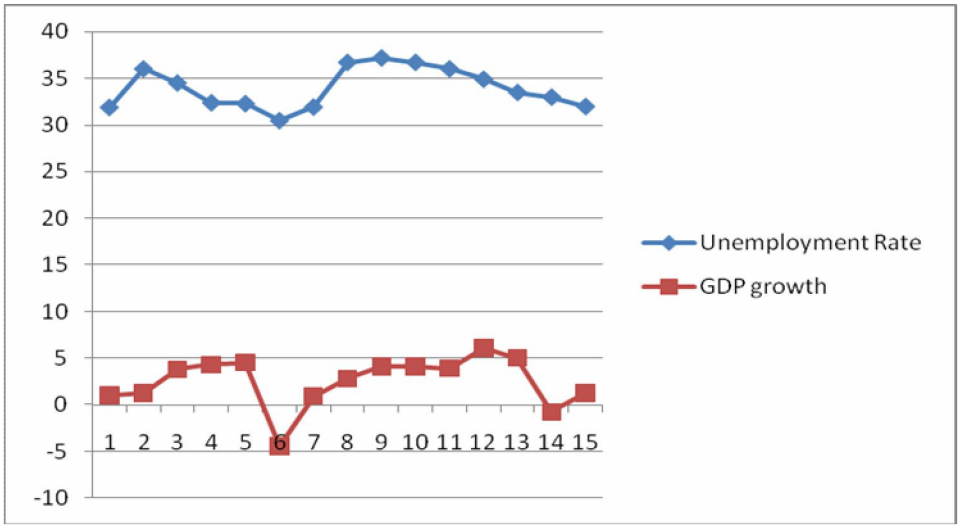
Year	Working age	Employed	Unemployed	Labor force	Participation rate	Employment rate	Unemployment rate
2000	794333	210297	112717	323014	40,66%	26,47%	34,90%
2001	782363	242042	113825	355867	45,49%	30,94%	31,99%
2002	778765	218562	104339	322901	41,46%	28,07%	32,31%
2003	787800	217800	124000	341800	43,39%	27,65%	36,28%
2004	796423	202355	123063	325418	40,86%	25,41%	37,82%
2005	801376	213074	132838	345912	43,16%	26,59%	38,40%
2006	809960	218431	129418	347849	42,95%	26,97%	37,21%
2007	814034	231399	127599	358998	44,10%	28,43%	35,54%
2008	816569	235532	122187	357719	43,81%	28,84%	34,16%

Source: SSO of Macedonia

Other employment data are available from the regular GDP estimation from the Sector of National Accounts of the SSO. In Figure 1 are compared the unemployment rate from the Labor Force Survey (LFS) with GDP growth. As expected GDP and the employment rate are procyclical with the only exception in year 2001. In 2001, GDP growth declined rapidly due to the ethnic conflict in Macedonia but employment and unemployment did not respond immediately. There was even a decline in the unemployment rate due to the recruitment of reservists. However, after 2002 the unemployment rate rose even though GDP

was growing. This unusual behavior can be explained through the decline in the participation rate, due to the grey economy and structural labor changes.

Figure 1. Cyclicality of Unemployment in Macedonia



Source: SSO of Macedonia

In this section I will proceed in the following way. In subsection 2.1 are outlined the main stylized facts related to the high rates of unemployment in Macedonia. This section provides an overview of the variance of the unemployment rate across different education levels, regions, gender and age groups. It is not sufficient however to consider the labor market solely by analyzing the static composition of the unemployment. It is essential therefore to consider the movement of people in to and out of jobs. This I do in subsection 2.2 by examining the duration of unemployment spells in Macedonia. In addition, this section presents stylized facts and findings from previous research that analyze how the effect of being unemployed for certain period of time varies across different groups of the labor force. Moreover, this subsection outlines the main features of unemployed benefit system in Macedonia. Since evidence from many countries suggests that when the benefits last for longer period labor participants are less willing to actively look for job, it is important to

evaluate them. However, in the case of Macedonia, the number of recipients of unemployment benefits is small. Also, as well, the duration of benefits can be from one month to one year the most (whereas the only exception are workers that are over 57 years old), thus it is not very realistic the assumption that they provide strong disincentive to work.

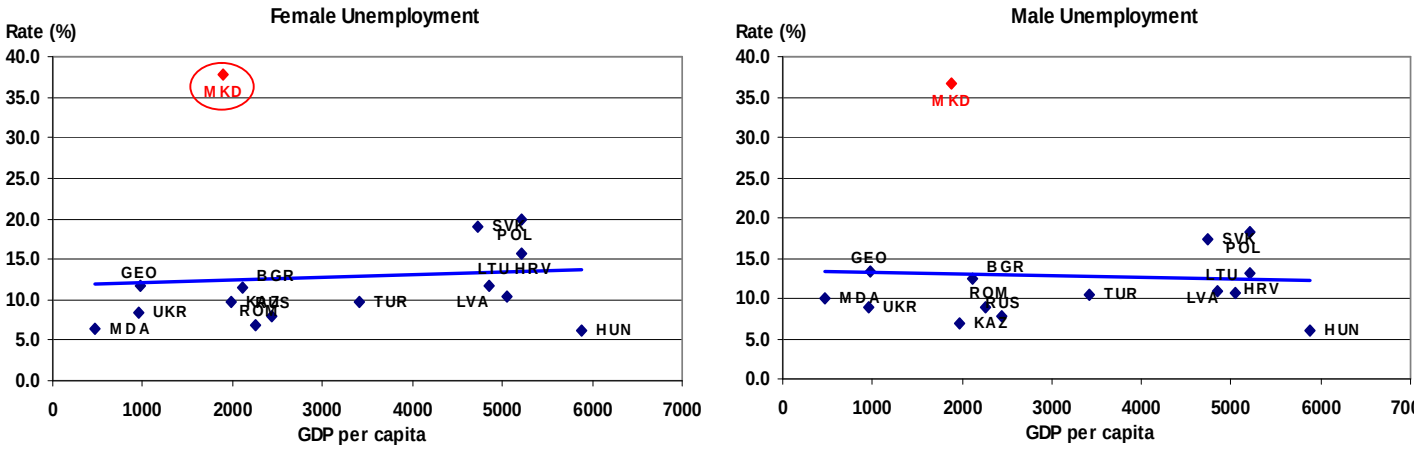
2.1 Unemployment

Despite the talks that there is high level of shadow economy and that this contributes for the high unemployment rates in the labor market, the unemployment continues to be one of the major issues for the Macedonian economy. Thus it is important to look in detail of its structure and the differences that appear by region; age; educational level and gender. The problem of unemployment is more complex if one takes into consideration that the major share of the unemployed is composed of either long-term unemployed workers or young workers that have entered the labor market for the first time.

Even in former Yugoslavia when most of the regions were more or less equally developed Macedonia was the one with the highest unemployment rate. The transition processes and the conflict in 2001 led to an increase in unemployment rates and to a higher gap compared to the rates in the ECA region. On average the unemployment rates within the ECA vary between 5 and 20%. Despite many years of policy reform the high unemployment rate in Macedonia persists and remains one of the major concerns for the economy. Today Macedonia is the country with the second highest unemployment rate in Europe at 32.2% (2009), with Kosovo having the highest rate at 45% (2009). Before the independence of Kosovo, Macedonia with its significantly higher rates compared to other countries in the ECA region was considered an outlier within the region (Figure 2). The high unemployment

rate presents a big challenge for Macedonia, because of the negative social and economic consequences. A higher unemployment rate lowers tax revenues and increases spending (as more people become dependent on social assistance and unemployment benefits). Moreover, unemployment represents unutilized human capital and it is often associated with causing social and financial distress among individuals, families, and communities.

Figure 2. Macedonia's Unemployment an Outlier in the ECA region



Source: World Bank (2005b)

Even though Table 2. and Table 3. suggest that women have significantly lower participation rates compare to men there are no differences in the unemployment rates of the gender groups. In the last years as it can be seen from Table 4. the unemployment rates for men are even higher compare to those for women, which is in contrast to the labor trends characteristic for European countries in transition. Stefanova and Terrell (2007) for example consider the European labor market and find that on average unemployment rates among women are higher than those for male with similar characteristics. In Macedonia however the unemployment rates for men are higher than those for women over the period of study, with

the shares of unemployed for men being 57.56% in 2010 and that for women 42.44%. There has been a slight reduction in this gap over the period 2007-2010.

The major variance in unemployment rates exists between different age groups rather than gender groups. Table 4 which reports unemployment by age groups shows that the reduction in the unemployment rate from 36.69% in 2005 to 32.2% in 2009 has been driven by the decrease in unemployment rates among younger workers in the age range of 15-24 and 25-34 years old. The decrease in the unemployment rate for these groups is partially offset however by the increase in unemployment among old workers. From 13,43 % in 2007 grew to 17,177% in 2010. The unemployment rates of middle age workers remained unchanged in the period of 2007 to 2010.

Table 4. Structure of Unemployed by Age Groups (2007-2010)

Year	2007		2008		2009		2010	
	Total		Total		Total		Total	
15-24	54096	15,15%	49298	14,36%	47916	14,04%	43113	13,42%
25-34	96262	26,95%	88616	25,81%	86409	25,32%	78350	24,38%
35-54	158827	44,47%	153490	44,70%	151570	44,41%	142770	44,43%
over 55	47981	13,43%	51959	15,13%	55400	16,23%	57108	17,77%
Total	357166		343363		341295		321341	
	Female		Female		Female		Female	
15-24	25011	7,00%	23324	6,79%	22908	6,71%	20249	6,30%
25-34	44552	12,47%	41846	12,19%	41239	12,08%	37341	11,62%
35-54	65179	18,25%	64251	18,71%	64789	18,98%	61066	19,00%
over 55	13328	3,73%	15462	4,50%	17003	4,98%	17726	5,52%
Total	148070	41,46%	144883	42,20%	145939	42,76%	136382	42,44%
	Male		Male		Male		Male	
15-24	29085	8,14%	25974	7,56%	25008	7,33%	22864	7,12%
25-34	51710	14,48%	46770	13,62%	45170	13,23%	41009	12,76%
35-54	93648	26,22%	89239	25,99%	86781	25,43%	81704	25,43%
over 55	34653	9,70%	36497	10,63%	38397	11,25%	39382	12,26%
Total	209096	58,54%	198480	57,80%	195356	57,24%	184959	57,56%

Source: National Employment Agency of Macedonia

In Table 1 where are reported the overall unemployment rates can be seen that unemployment rates have decreased since 2005. The drop in unemployment rates from 2005 to 2010 have happened primarily due to the drop in unemployment among less educated groups. On the other side the number of unemployed individuals with secondary education have not decreased. Moreover for the individuals with university or graduate degree the unemployment rates have increased slightly. The largest decrease in unemployment between

2008 and 2010 (from 49.25 to 48.88 percent) occurred among individuals who have attained at most primary education. Contrary to evidence for European countries the data suggest a slight increase in unemployment among more educated segments of the population, and in particular among educated adults, in Macedonia. These results may indicate that improvements in employment rates were driven by labor market reforms targeting individuals from less educated groups, and particularly among those with primary education or less. In detail the structure of unemployment by level of education in the time period of 2008 to 2010 is presented in Table 5.

Table 5. Structure of Unemployment by Level of Education

YEAR	2008		2009		2010	
	Total		Total		Total	
Without or less than primary	169093	49,25%	167858	49,18%	157081	48,88%
Primary or 1,2 secondary	12161	3,54%	11825	3,46%	11167	3,48%
3-year Secondary	55307	16,11%	53527	15,68%	49690	15,46%
Specialization	21	0,01%	14	0,00%	28	0,01%
4-year Secondary	82369	23,99%	81904	24,00%	77748	24,19%
Advanced Training	5671	1,65%	5314	1,56%	4889	1,52%
Undergraduate Degree	18550	5,40%	20614	6,04%	20428	6,36%
Master Degree	184	0,05%	229	0,07%	292	0,09%
Doctorate	7	0,00%	10	0,00%	18	0,01%
Total	343363		341295		321341	
	Female		Female		Female	
Without or less than primary	69675	20,29%	70326	20,61%	64163	19,97%
Primary or 1,2 secondary	3214	0,94%	3320	0,97%	3224	1,00%
3-year Secondary	17755	5,17%	17395	5,10%	16163	5,03%
Specialization	13	0,00%	5	0,00%	16	0,00%
4-year Secondary	40153	11,69%	39780	11,66%	37757	11,75%
Advanced Training	2626	0,76%	2478	0,73%	2329	0,72%
Undergraduate Degree	11359	3,31%	12525	3,67%	12560	3,91%
Master Degree	86	0,03%	105	0,03%	159	0,05%
Doctorate	2	0,00%	5	0,00%	11	0,00%
Total	144883	42,20%	145939	42,76%	136382	42,44%

Source: National Employment Agency of Macedonia

Macedonia is not equally developed throughout its geographical area, with pronounced regional differences existing. These disparities are reflected in differences in

regional activity rates and regional GDP. Consequently, the unemployment rates across regions differ significantly. According to the Statistical Office of Macedonia there are 30 statistical communities: Berovo (1), Bitola (2), Makedonski Brod (3), Vinica (4), Valandovo (5), Debar (6), Delcevo (7), Demir Hisar (8), Gevgelija (9), Gostivar (10), Kavadarci (11), Kicevo (12), Kocani (13), Kratovo (14), Kriva Palanka (15), Krusevo (16), Kumanovo (17), Negotino (18), Ohrid (19), Prilep (20), Probistip (21), Radovis (22), Resen (23), Skopje (24), Struga (25), Strumica (26), Sveti Nikole (27), Tetovo (28), Veles (29), and Stip (30). Figure A1 in the appendix presents the regional unemployment rate by region between the years 2002 and 2005. Unemployment rates display large differences across regions with rural regions having lower unemployment rates. Kumanovo, Stip, Veles, and Ohrid are regions with higher than average unemployment rates, both for young and adult workers. On the other hand, Strumica (a region with a large agriculture sector) and Tetovo display lower than average unemployment rates. These results are consistent with the employment indicators presented in section 2, Table 1. from where it can be seen that for these two regions employment rates grew between 2004 and 2006. Naturally, the largest shares of the unemployed are in Skopje (23.1%) since around one third of the labor participant live in the capital. Other regions with high shares of unemployed are Bitola (6.96%), Kumanovo (6.73%), Prilep (5.96%) and Tetovo (6.22%). In these five regions alone live almost half of the unemployed in Macedonia (48.7%).

In the period 2002- 2006 the most significant decreases in unemployment rates occurred in the regions of Tetovo, Bitola, and Strumika. The most important occurred among young workers, with the rates declining from from 52 percent to 38 percent in Bitola, from 32 percent to 23 percent in Strumika and from from 47 to 37 percent in Tetovo. In the capital of Macedonia, Skopje the unemployment rate among older workers increased over the period

2007-2010. Table 6 shows that the share of the unemployed from Skopje decreased from 23.65% in 2007 to 22.11% in 2010. This hides a good deal of heterogeneity across age groups with the share of older workers in total unemployment increasing from 14.57% in 2007 to 20.09% in 2010. The significant increase in the unemployment rate among adults in Skopje was mainly driven by a drop in labor force participants for this group. The overall number of unemployed individuals did not increase in the region during the period of analysis. Further analysis may be needed to understand drops in labor force participation in Skopje.

Table 6. Structure of Unemployed from Skopje by Age Group

Year	2007		2008		2009		2010	
	%of Total of Skopje	% of Total of Macedonia	%of Total of Skopje	% of Total of Macedonia	%of Total of Skopje	% of Total of Macedonia	%of Total of Skopje	% of Total of Macedonia
15-24	13,46%	3,18%	12,97%	3,04%	12,93%	3,01%	12,06%	2,67%
25-34	28,09%	6,64%	26,44%	6,21%	25,24%	5,87%	23,71%	5,24%
35-54	43,88%	10,38%	44,15%	10,36%	43,66%	10,16%	44,13%	9,76%
over 55	14,57%	3,45%	16,44%	3,86%	18,18%	4,23%	20,09%	4,44%
Total in Skopje	100,00%	**23,65%**	100,00%	**23,47%**	100,00%	**23,27%**	100,00%	**22,11%**
Female								
15-24	6,70%	1,59%	6,68%	1,57%	6,73%	1,57%	6,18%	1,37%
25-34	13,92%	3,29%	13,11%	3,08%	12,51%	2,91%	11,89%	2,63%
35-54	19,27%	4,56%	19,41%	4,56%	19,13%	4,45%	19,07%	4,22%
over 55	4,33%	1,02%	5,17%	1,21%	5,89%	1,37%	6,60%	1,46%
Total for Female in Skopje	44,22%	10,46%	44,37%	10,42%	44,26%	10,30%	43,74%	9,67%

In Skopje, the unemployment rate was higher than the national average in 2007. In 2010 this was still the case, with Skopje accounting for 41.6% of total unemployment. A

more detailed analysis indicates that the unemployment rate in rural Skopje is higher than in urban Skopje (51 percent versus 34 percent in 2006). Regardless of the high unemployment rate in rural Skopje, the overall unemployment rate for the region depends mainly on the rate for urban Skopje (where 80 percent of the labor force lives).

Further analysis may also be needed to understand the potential role of internal migration in the regional evolution of unemployment rates. The lack of convergence across regions points to the weaknesses of equilibrating mechanisms such as wage adjustments and constraints to interregional migration. This is an area of great interest where further analysis is required. Unfortunately, data on internal migration is limited.

The large variation in unemployment rates within a country is associated with disparities in living standards across regions (World Bank, 2005a). Regional differences can be presented through the coefficient of variation. The coefficient of variation is one of the indicators that is used by the EU to support the implementation of the Lisbon strategy for employment, innovation and research, economic reforms, social cohesion and environment (Pechar 2005). The coefficient of variation of regional unemployment rates is estimated by weighting the variance of the unemployment rates. According to Eurostat's methodology this is defined as:

$$Var\left(\frac{x_i}{y_i}\right) = \sum\left(\left[\frac{x_i}{y_i} - \frac{\bar{x}}{\bar{y}}\right]^2 \frac{y_i}{\sum_i y_i}\right). \quad (1)$$

where x_i denotes unemployed persons in region i, y_i represents the active population in region i, $\bar{x}$ and $\bar{y}$ stand for the averages of x_i and y_i, and $\bar{x}/\bar{y}$ is the unemployment rate at the national level. The coefficient of variation of unemployment rates is the square root of the

variance stated in equation (1) divided by the unemployment rate at the national level. It gives a measure of the regional spread of unemployment rates.

Differences in unemployment rates across regions have also been documented for other ECA countries (Boeri and Scarpetta, 1996; Huber, 2006). Table A2. in the appendix presents regional indicators related to labor market disparities for a sample of Central and Eastern European Countries. The results show that for most countries in the sample the ratio of the maximum to the minimum unemployment rate is large exceeding a value of 3, the major exceptions to this being Poland, Lithuania and Latvia.

In Macedonia this ratio increased from a value of 2.6 in 2005 to 3.5 in 2006 as it can be seen in Table A2 presented in the appendix. This fast increase can be attributed to geographically non-homogenous economic prosperity and development. It can also signal that there is a trend towards widening of the gap in living standards within the country. According to previous research the lack of convergence across regions is evidence for weak equilibrating mechanisms such as wage adjustment and/or interregional migration (Boeri and Scarpetta, 1996; World Bank, 2005a).

2.2 Duration of Unemployment Spells

As stated by the European Commission (Employment in Europe 2009) the same rate of unemployment can represent two very different realities for the welfare of the unemployed. For instance, a rate of 10% can mean that every participant in the labor force has experienced a short term unemployment of 5 weeks or that 10% of the population has been unemployed for the whole year. As stated in the report a labor market with lower unemployment rates but with people who are likely to remain unemployed for long periods of time is more damaging than one with higher unemployment rates but with labor force participants that will remain unemployed only for short period of time.

According to estimates using the 2006 LFS data around 55 percent of the unemployed workers in Macedonia are first time job seekers. Table 7 reports the shares of unemployed workers in rural and urban regions that are either first time job seekers or that have been employed previously. Roughly half of all unemployed (54 percent) are first time job seekers and the other half have either been laid off or have quit. The biggest share of first time job seekers is made of individuals in the age group of 15-24. However, the share of adults older than 35 years old that are first time job seekers is not negligible at approximately 30 percent. This reflects the inability for certain type of workers to enter the workforce. In relation to the education level of the unemployed the 2006 LFS estimates indicate that around 60 percent of all unemployed with primary education are first-time job seekers. As anticipated, this share is significantly higher compared to the share of unemployed workers with higher levels of education (who are more likely to have been employed at some point). This is an indication that many first-time job seekers have a high probability of remaining unemployed for a longer period of time.

Table 7. Shares of First-time Job Seekers and Laid of or Other in 2006

	Total Unemployed*	% Rural	% Urban	Subtotal	% Rural	% Urban	Subtotal
		First-time job seekers			Laid off + Other		
Total	321,028	21.8	32.8	54.5	14.2	31.3	45.5
Female	129,363	22.5	38.3	60.8	8.8	30.4	39.2
Male	191,666	21.3	29.1	50.3	17.8	31.9	49.7

Source: World Bank (2008)

A worrisome indicator for the labor market in Macedonia is that a large share of the unemployed are long-term unemployed. Long –term unemployment (LTU) is defined as being unemployed for over one year. According to previous research based on the LSF

estimates for 2006, 91 % of the unemployed that are not first-time seekers are long term unemployed. This is troubling since as the unemployment spell grows the probability that the worker will find a job reduces. Across all age groups the group most affected by long term unemployment is that of adults within the age range 35-64. Table 8 shows the variation in unemployment duration by age groups. According to the World Bank (2008) study when survey weights for population are used, estimates indicate that about 133 thousand individuals (mainly adults) could be classified as long-term unemployed in 2006.

Table 8. Duration of Unemployment within Age Groups (with excluded first-time job seekers)

% Unemployed	*15-24*	*25-34*	*35-54*	*55-64*	*All WAP*
< 1 year	33.6	17.0	6.5	4.0	9.1
1-3 years	60.5	50.5	33.9	33.1	37.7
4 and +	6.0	32.5	59.6	62.9	53.3

Source: World Bank (2008) estimates using 2006 LFS data.

There is consensus in the literature that suggests that duration of unemployment can be significantly decreased once the unemployment benefits are reduced. Unfortunately the available dataset does not include information if the unemployed individual receives any benefits. However, the low number of unemployed that receive benefits as well as the short duration of the benefits in Macedonia can lead to the conclusion that the system does not provide incentives for the workers to stay unemployed for longer period of time.

In Macedonia an unemployed individual is eligible for unemployment benefits if he/she has been employed for at least nine months continuously, or at least for a year in the case of termination of the employment status in the last18 months. The time they are eligible

for benefits depends on how long they have been employed. It can vary from one month up to a year. In table A 3 in the Appendix A is given the summary of the length of the unemployment benefits as determined by the length of being employed. The receivers of unemployment benefits have to visit the Employment Agency in Macedonia every 30 days in order to keep their right for benefits. The level of the benefits is determined by the earnings that were received in employments. It is set to 50% of the average wage of the worker received in the last two years. However if the unemployed is over 57 years old if women or over 59 years old if men and has been employed for at least 15 years, then he/she is eligible for unemployment benefits until the rights for pension benefits is activated. One can speculate the older workers have incentive to stay unemployed when they are entitled to benefits until they start receive pension.

In Table A 4. in the appendix is presented description of the main features of the unemployment benefits systems for countries in Central Eastern Europe (CEE) (Vodopivec et. al). Compared to the unemployed benefits systems in CEE the system in Macedonia can be categorized as equally generous. Moreover the share of the unemployed in Macedonia is very low. In CEE this is significantly higher. For instance the share of unemployed recipients of the total unemployed in 1999 was 43% in the Chezh Republic and 61% in Slovenia. Also as it can be seen from Table 9. where the shares of unemployed that receive benefits are reported the number of recipients of benefits in Macedonia have decreased. This rapid decline, while unemployment have remained almost same, can be attributed to two sources. First, the eligibility criteria become tougher and the number of long term unemployed have increased. Second, it can be attributed to the political influences in determining the criteria under which one is eligible for benefits. The number of eligible participants was highest during 2004 when presidential elections were held in Macedonia.

Table 9. Percentage of Unemployed Receivers of Health Insurance or Unemployment Benefits in Macedonia

Year	Health insurance	Unemployment benefits
2003	61.00%	11.54%
2004	64.59%	12.62%
2005	67.41%	12.01%
2006	67.81%	9.52%
2007	68.52%	7.54%

Source: SSO

3. Data

The empirical analysis in this research paper is performed with data obtained from the Employment Agency of the Republic of Macedonia. The data covers the period between January 1st 2002 and December 31st 2005. The data consists of total of 430,425 unemployment spells. This is the number of the spells and not the number of unemployed individuals since one person can enter and exit unemployment several times in four years.

From the descriptive statistics in Table 9. can be seen that the mean value is 348 days. This suggests that on average one spends around a year in unemployment. However the median of 269 tells that for half of the unemployed is needed less time to exit unemployment. From the histogram of the unemployment spells presented in Figure A2. in the appendix can be seen that the distribution of the spells has a long right tail and is more narrow compare to normal distributions.

Table 10. Descriptive Statistics for the Unemployment Spells in the Data

	Mean	95% confidence interval for M	Median
Central tendency	348.21	(347.42, 348.78)	269.00
	Minimum	Maximum	St. deviation
Dispersion	0	1437	296.082
	Skewness	Kurtosis	
Skewness and kurtosis	1.09	0.756	

Other important characteristics that the data contains and are used in the empirical analysis are:

- **Gender;**

The variable gender is dummy variable that takes value of one for unemployed males and zero for female. The proportion of the unemployed who are female is 56.2%, being 43.8% for males.

- **Age;**

The variable age is a continuous variable, with a mean of 35.41 years and a standard deviation of 12.18. The histogram of the variable age can be seen in Figure A3. in the appendix.

- **Education.**

For the education variable are not observed the number of years spend schooling but is observed the level of education obtained. More precisely in the dataset nine distinct education levels are observed: no education (0), one year of secondary education (1), two years of secondary education (2), three years of secondary education (3), four years of secondary education (4), advanced training or specialization (5), university level (6), master's degree (7), and doctorate (8). The largest share of unemployed (38.52%) is without education. The other educational levels that have high shares of unemployed are made of individuals with four years of secondary education (29,89%), three years of secondary education (18,26%) and University level education (9,01%). The data shows that the concentration of unemployed is higher among the least educated.

- **Statistical region**.

Macedonia is divided into 30 statistical regions as described in section 2.1.

However the available dataset is subject to many limitations. First of all the information that can be culled out is very limited. It allows to look at the effect of education; region; age and gender on the probability to leave unemployment in the next short period. It can not be seen the effect of different ALMPs nor can be understood the effect of unemployment benefits on the duration of the spell. This leaves open space for future research.

Another limitation of the data is that in total 213,430 or only half (50.42%) of the spells in the dataset have ended by the end of the observation period. The share of the spells that continue to last in the period that is not observed is significant in relation to the total number of observations. Since the end date of this spells is not observed it is not possible to estimate their upper bound. However it is important to include them in the estimation. Even though the upper bound is not knows, it is known that they have lasted at least until the end period. An appropriate way to approach such data is by duration models. These models are introduced in the next section.

4. Methodology

The duration models are based on the theory of survival analysis. Survival analysis were first applied in biomedical research and engineering. They have been used to study the length of survival after an operation such a heart transplant. Likewise, in engineering, the analysis of the survival time has been applied to study the length of time until failure of electric and/or electronic components. Since the survival analysis models have long tradition in engineering and biomedical research most of the terminology coincides with the one that is used in these fields such as: failure time data, hazards, survivor function and etc.

The usefulness of the survival analysis has been recognized by social sciences, as well. Survival techniques have been applied to study many different events such as strike duration, length of time between purchase and warranty claim, time until business failure, length of unemployment spells, intervals between conception, intervals between purchases and so on (Greene 2008). Duration models have gained a lot of popularity in economics in the last 20 years. For instance they are extensively used in population economics to study marriage durations (Lillard, 1993) or the event of birth of child (Heckman and Walker, 1990) and etc. Furthermore duration models are applied in business economics for studying the probability until a major investment (Nilsen and Schianterelli 1998) as well as in migration economics in studying return to migration (Lindstron, 1996). Also, duration models are applied in other areas of economics such as macroeconomics or finance to study business cycles (Diebold and Rudebusch 1990) or investigate the stock-market share durations (Engle and Russell, 1998).

Moreover, duration techniques are very often used by labor economists. They have been applied in studying duration of employment (Devine and Kiefer, 1991), the effectiveness of Active Labor Market Programs (ALMP) (Rosholm and Svarer, 2004), the effects of unemployment benefits on unemployment durations (Hunt, 1995) and etc.

This section presents the main features of the duration data and models. First, briefly are addressed the potential limitation of the duration data. Afterwards, are introduced three distinct types of duration models that are known as parametric; semi-parametric and non-parametric, and the drawbacks of each model are identified. Based on that discussion is derived conclusion which type of duration model is best estimate for the probability to exit unemployment. The analysis in this section is a departure point for the empirical estimates presented in the next section of the thesis. The discussion is mainly based on the following sources: Kiefer(1988), Greene(2008), Kaplan-Meier(1958), Cox (1972).

Two major limitations of the duration data can be distinguished. In first place, censoring is unavoidable problem in the analysis of duration data. This happens because the period that is observed is limited. For the dataset used in the empirical analysis the beginning times are known with precision. However the dataset includes many observations of individuals who remain unemployed after the last period observed. For this individuals the spell is ongoing. This is an example of right-censored data.

When the unemployment spell is censored it is known that it has lasted at least up to the last observed period in time (in this case up to 31st of December) but it is not known its exact length. Even though, the exact length is unknown censored data should not be omitted. However, one must take into account the censored nature of the data and consider that this data requires stronger assumptions compare to uncensored dataset. For instance, in the case of censored data when the assumptions for homoskedasticity or normality are violated the regressors will be inconsistent.

Another potential problem of duration data is the treatment of time varying covariates (Greene, 2008). When the duration of unemployment is analyzed for four years, it is not very likely to assume that the covariates will remain unchanged. For example, one can decide to

go back to school and thus one more year of education can add significant impact on one's probability to exit unemployment in the next period. Thus, it is important to allow the covariates to vary over time.

The duration models can be divided into two groups: non parametric and parametric. In the subsections are formulated the models, as well, are indicated the potential problems of each models when applied to the research question. The theory in the next sections closely follows Greene's chapter dedicated on "Models for Event Counts and Duration". The convention used for the theoretical description of the parametric, the Cox and the Kaplan-Meier duration models is same as the one used by Greene(2008).

Since duration models are specified in terms of the conditional probability, they are good estimates of the probability of leaving unemployment. The intuitive difference between conditional and unconditional probability is captured in Kiefer (1988) by the following example. Suppose there is one unemployed individual that is searching for job. Assume, as well that it should be estimated the probability that the worker will be unemployed exactly for 10 days. Then, the model can specify that the probability of finding a job is same every day. However, the assumption that the sequence of conditional probabilities will be constant in every period is not very likely. As a matter of fact, it is more likely to assume that the probability of finding a job will vary (Kiefer, 1988). For instance, one can assume that the probability to find a job in the last period is higher since the time spend looking for job has intensified. As well, one can assume that the probability of finding a job in the last period is lower because the reasons for being unemployed in first place are more complex. Thus, it is important to think in terms of conditional probabilities and not the unconditional.

4.1 Parametric Approach

The parametric models are build on the reasoning that the duration analysis can be approached in similar manner as the regression analysis. This is the case when the spells are observed. Moreover, if the analysis is conditioned on set of covariates x, which are fixed from the beginning up until the end period, then it can be assumed that the distribution is normal. However, it is not very realistic to assume that the distribution will be normal. Such assumption is not likely because duration variables can only take positive values, while normal distribution does not exclude negative values. More realistic is to assume that the distribution is lognormal. However, it turns out that this is only one of the many possibilities.

For our analysis we are interested in the probability that the length of the spell lasts at least until t. This probability is given by the survival function given bellow.

$$S(t) = \frac{\text{number of unemployment spells surviving until time t or longer}}{\text{total number of unemployment spells observed}}$$

The survival function can be introduced more formally. For that purpose, it is defined the cumulative probability for the spell length represented by the random variable *T*. The random variable T is used as notation of the spell length. Given that *T* has continuous probability distribution $f(t)$, the cumulative probability is:

$$F(t) = \int_0^t f(s)ds = \Pr ob(T \le t) \quad (1)$$

Consequently the survival function $S(t)$ that looks at the probability that unemployment will last at least until time t or longer will be equal to:

$$S(t) = 1 - F(t) = \Pr ob(T \ge t) \quad (2)$$

where T denotes survival time – duration of unemployment spell, and $F(t)$ as defined in equation (1) is the cumulative probability.

Even though, the survival function is informative the main focus in the duration analysis is not the survival function itself but the rate that looks at the conditional probability that the spell will end in the next short period given that it has lasted until time t. For the parametric models, the survival function is modeled in order to obtain the hazard rate. Before to introduce the hazard rate it is defined the probability that the spell will end in the short period Δt, given that it has lasted at least t. This probability is:

$$l(t,\Delta t) = \Pr ob(t \le T \le t + \Delta t \mid T \ge t) \quad (3)$$

The rate that is central for duration analysis is the hazard rate. That is the rate at which the unemployment ends, given that the unemployment spell has lasted at least until *t*. This rate is defined as:

$$\lambda(t) = \lim_{\Delta t \to 0} \frac{\Pr ob(t \le T \le t + \Delta t \mid T \ge t)}{\Delta t} = \lim_{\Delta t \to 0} \frac{F(t+\Delta t) - F(t)}{\Delta t S(t)} = \frac{f(t)}{S(t)} \quad (4)$$

From the formulas for the hazard rate presented by equation (4) and the survival function as given in equation (2) it can be seen that they are related. The hazard function is:

$$\lambda(t) = \frac{-d \ln S(t)}{dt} \quad (5)$$

So

$$f(t) = S(t)\lambda(t) \quad (6)$$

The parametric models as defined and the hazard function related to this models are not the best estimates when looking at the problem of unemployment for number of reasons.

The first reason is that when working with these models it is necessary to make assumption on the distribution of the hazard function. As defined in Greene (2008), the hazard function is said to have positive duration dependence when it slopes upwards. In other words, positive duration dependence means that the probability that the spell will end in time *t* given that it has lasted up to some point in time *t* is increasing in *t*. In the opposite case, when the hazard function slopes downwards is said to have negative duration dependence. When looking at the unemployment spells it is unclear whether the spell will end at time *t* given that it has lasted until time *t*. Since it is not clear whether the unemployment data can be characterized by positive or negative distribution is wrong to make assumption of distribution that display one or other characteristics for all the time periods *t*. The possibility of distribution choices for the duration models varies. It can be: normal, inverse, F, gamma, lognormal, Weibull, and so on. The different distribution can display very different behaviors in their hazard function. This is illustrated in Figure A 4. in the appendix (Greene, 2008). Even though, it is simple to work with parametric models, they impose many assumptions on their structure. Thus, the danger that the hazard rates will be biased is higher for these models.

Another problem with the parametric models is the problem of heterogeneity. This occurs when external factors are not included in the survival function. The parametric model is specified such that it does not considers that exogenous factors, not specified in the model, can have significant effect on the hazard rate. The problems of heterogeneity can be overcome with the Kaplain Meier and the Cox duration model. Therefore, the probability to exit unemployment conditional on duration analysis is estimated by these two models, only. The main features of these models are explained in the next subsections.

4.2 Nonparametric Approach: Kaplan- Meier

The product limit estimator, introduced by Kaplan-Meier (1958), is empirical, nonparametric approach in estimating the survival and hazard function. Previous analytical papers that explain and use non-parametric models in their analysis include Kaplan and Meier (1958), Foley(1997), Klein and Moeschberger(1998) and Earle and Pauna (1996). The benefits of the Kaplan –Meier estimator can be elaborated into two levels. First, it does not have the problem of heterogeneity that is characteristic for the parametric models. Second, for the Kaplan-Meier estimator is not needed to make assumptions for the distribution of the duration data. It is only needed to assume that all survival times follow the same distribution.

Suppose that there are *n* observations and k distinct survival times in the data; k will be equal to the number of observations if there are no observations with equal survival times. Assume as well that the observations are not censored and they are arranged in ascending order based on their survival times; so $t_1 \leq t_2$. Suppose n_k represents the number of observations for which duration is at least T_k. These observations constitute the risk set. Risk set is the set made of observation for which the length of the spell is at least up to t_i. With h_k is represented the set of observations completed prior to time T_k. Under these assumption the method of Kaplan and Meier (1958) estimates the following survival function S :

$$\hat{S}(T_k) = \prod_{i=1}^{k} \frac{n_i - h_i}{n_i} = \frac{n_i - h_i}{n_i} = 1 - \frac{h_i}{n_i} \quad (7)$$

Respectively, the hazard function will be:

$$\hat{\lambda}(T_k) = \frac{h_k}{n_k} \quad (8)$$

However the hazard rate estimator as defined with equation (8) has many limitations. First of all, the estimation does not take into account that there are many censored observation in the data. This can lead to a bias in the survival function. Another limitation of the Kaplan-Meier product limit estimator is its inability to integrate more covariates simultaneously. Regardless of its limitation is used in the thesis. This is because the plots of the Kaplan-Meier's survival functions can provide good description for the behavior of one variable.

4.3 Semi-parametric Approach: The Cox Model

The Cox's (1972) semi-parametric approach is duration method that can partially be immune to the heterogeneity problem of the parametric model and can integrate censored data of many covariates in its structure. Application of the semi-parametric Cox's proportional hazard model can be found in Gottschalk and Moffitt (1999) and Kupets (2006). The theoretical background of this model is presented bellow.

Suppose there are n observations, then the hazard function will take the following form:

$$\lambda(t_i) = \exp(x_i^{'}\beta)\lambda_0(t_i) \quad i = 1,2,...,n \quad (9)$$

,where λ_0 is the baseline hazard and β is vector of the regression coefficients. The baseline hazard describes the hazard that is linked to each observation's unobserved characteristics. Thus unlike the parametric model, the Cox's model allows for heterogeneity. In order to remove the heterogeneity is using a conditioning operation. Assume there are K different exit times in the sample: $T_1,...,T_k$. Any exit time T_k has corresponding risk set R_k. The risk set is the set of all the observations that have not yet exited (unemployment) at the time T_k. Thus,

their exit time will be at least T_k. At the exit time T_k, the probability that this will be exit rate for observation i given that exactly one individual exits is given by:

$$\Pr ob[t_i = T_k \mid R_k] = \frac{e^{x_i'\beta}}{\sum_{j \in R_k} e^{x_j'\beta}} \quad (10)$$

For the Cox model the vector of the covariates can be estimated without specifying the baseline hazard. Therefore it can be concluded that the model deals successfully with the problem of heterogeneity. Another benefit is that the Cox's models is not limited in terms of how much information can be gathered from it. Namely, the model can be specified to look at the effect of many covariates simultaneously.

Thus, it can be concluded that the Cox proportional hazard model is better estimator in comparison to the parametric and the Kaplain-Meier model.

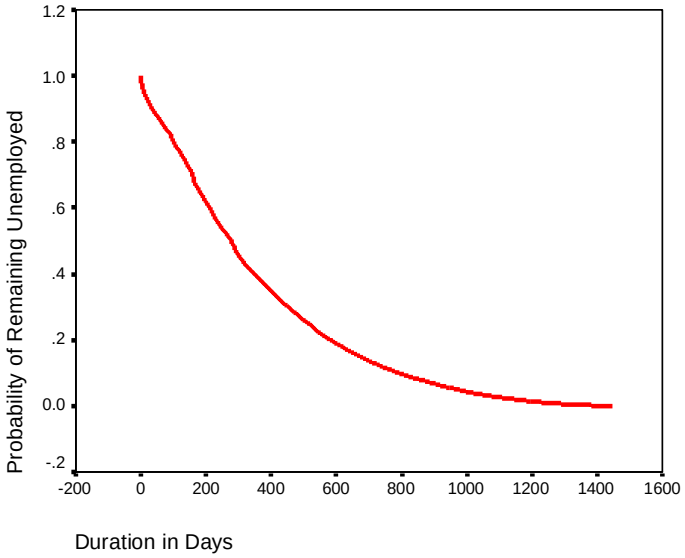
5. Results

5.1 Kaplan-Meier Results

The survival function for unemployment duration estimated by the Kaplan-Meier product limit estimator, can be seen in Figure 3. On the horizontal axes is given the probability that the unemployment spell will continue in the next short period. The vertical axes reports the rate of the unemployment spells that have started and are still ongoing. As anticipated, the function starts at one and drops monotonically to zero. It is also important to note that the function does not take into consideration calendar dates. It is not important when the spell has started but rather how long it has lasted. Moreover, if one wants to look at the changes in probability of exiting unemployment conditional on the length of the spell, then one needs to look at the slope of the survival function.

The median survival time is the smallest survival time for which the survival function is less than or equal to 0.5, which in this case is 269 days. The mean survival time is estimated as the area under the survival curve based upon the entire range of data, and in this case is equal to 348 days. The higher value of the mean compared to the median indicates that the distribution of the duration of unemployment spells has positive asymmetry, with a long right tail. This implies that there are some unemployment spells that have an unemployment duration significantly higher than the mean duration.

Figure 3. Kaplan-Meier Survival Function for the Unemployment Spells



In order to evaluate the effect of education on the probability to exit unemployment, the survival functions for three different educational levels are plotted. Figure 4. plots the survival estimates for individuals with no education (education level(0)); for individuals with four years of secondary education(education level(4)); and for individuals with university degree (education level(6)). These three education levels present low, medium and high educated workers. The plot suggests that the probability of remaining unemployed is highest for the least educated workers. The median unemployment duration for individuals with four years of secondary education is 23.85% higher than for those with university education. Furthermore, the median is 36.02% higher for individuals with no education when compared with those with university education.

Figure 4. Kaplan Meier Survival Function for Low, Medium and High Educated Workers

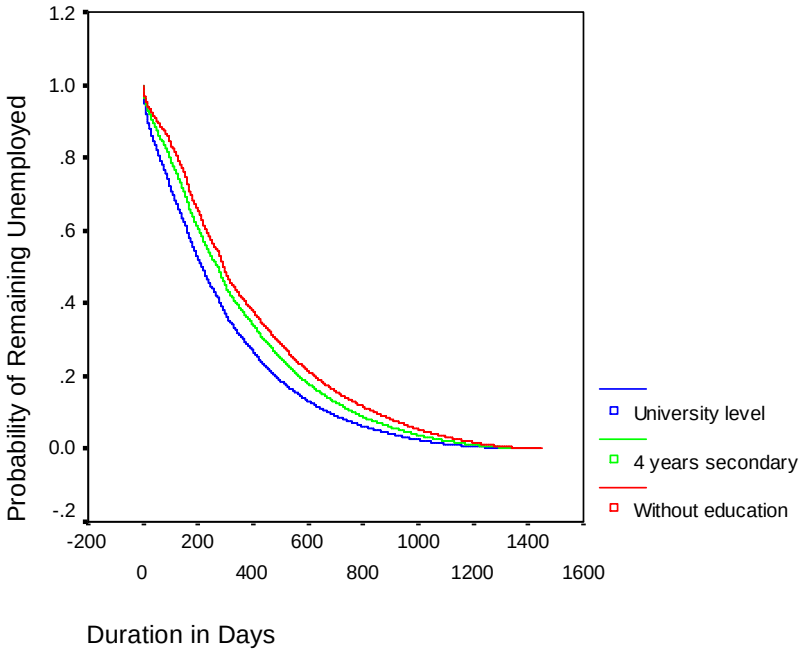


Figure A 5. A 6 and Figure A 7. presented in the appendix section also compare the survival function of different educational levels. In particular Figure A 5. reports similar results for unemployed individuals with university degree and with advanced training. The survival functions suggest that unemployed individuals with university degree have better prospects in the labor market. This demonstrates that differences in labor prospect appear significant even among individuals that differ by only one educational level.

Moreover, figure A 6, which is given in the appendix, compares survival functions of individuals that do not have university degree. The probability of remaining unemployed is lowest for individuals with advanced training, followed by those with four and three years of secondary education, with the highest probability being for those without education.

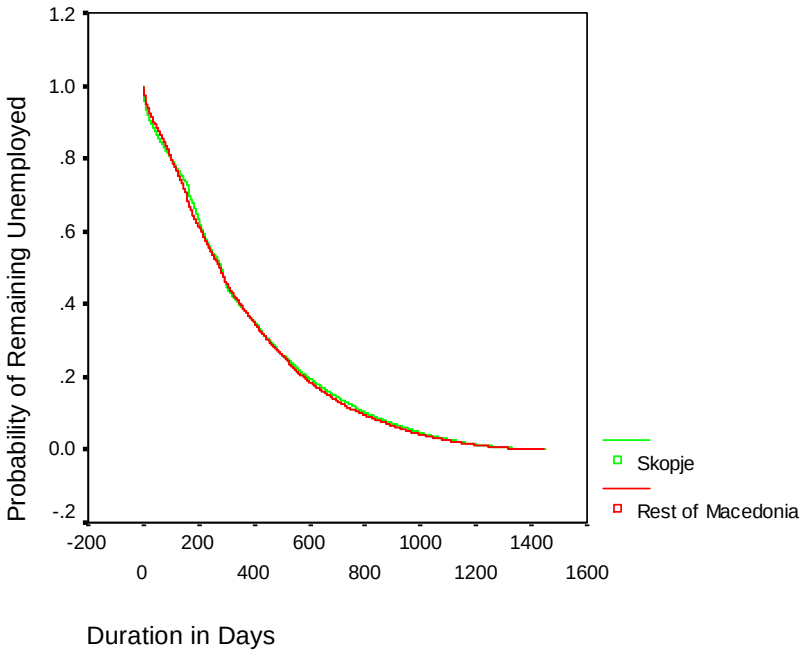
The survival functions for the three distinct university education levels are reported in Figure A 7. However, the number of observed individual with doctorate degree is very small.

Thus, the survival function of individuals with a doctorate degree should be looked with reservation. It is found that those with doctorate have the lowest probability of remaining unemployed. The survival function for the individuals with a master's degree suggests that they have higher probability of remaining unemployed compare to individuals with university level education. This is in contrast to the set expectations that each higher educational level should be translated into lower duration of unemployment.

Figure 4 and the Figures from A 5. to A 7, which displayed the Kaplan-Meier survival functions estimates for different levels of age and education, have one very important characteristic in common. That is, the probability of remaining unemployed is the same for individuals with different levels of education in cases where unemployment duration is more than 1100 days (around 3 years). This suggests that the advantages of higher levels of education become unrecognized by the labor market as unemployment duration increases.

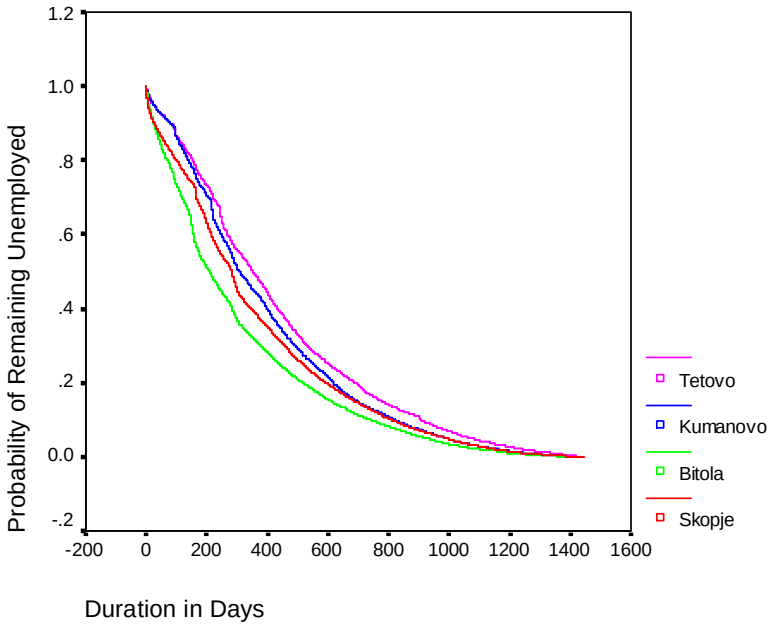
Next, is looked at the survival functions estimates for different regions in Macedonia. First, Figure 5 depicts the survival function estimates for the unemployed who live in Skopje and for those who live in the rest of Macedonia. More than one third of the labor force in Macedonia lives in the capital. In the last decade the number of labor force participants in Skopje has increased significantly. This is related to the fact that most of the major investments and job openings are concentrated within the capital. Such similar trends are noticed in many other transition economies. For most of the transition economies it holds that the labor market conditions in the capital, on average, are somewhat more favorable compare to the other regions within one country (Huber, 2006). Thus, one would expect the unemployed from Skopje to have higher hazard rate. But the results indicate that there are no significant differences in the survival curves.

Figure 5. Kaplan-Meier Survival Function for Skopje and the rest of Macedonia



Furthermore, Figure 6. compares the survival function estimates of Skopje and the three other big cities in Macedonia: Kumanovo, Tetovo and Bitola. From figure 13 can be concluded that labor participants in Bitola have the lowest probability to remain in unemployment. Participants in Kumano and Tetovo on average need more time to exit unemployment. This confirms the findings from the quantitative analysis in section 2. Western cities like Tetovo are characterized with the highest unemployment rates. This is to some extent due to the high level of the grey economy in these parts of the country.

Figure 6. Kaplan-Meier Survival Function for Skopje, Kumanovo, Tetovo and Bitola



In addition, are ploted the survival function estimates for different age groups. They are displayed in Figure A 8., in the appendix. In line with the expectations for transition economies (Stetsenko, 2002), it is found that older labor participants have the lowest probability to exit unemployment. In more particular, the descriptive estimates suggest that the median period of unemployment increased by 129.53% from the age group 18 or less to the age group 60 or more. The age group 18 or less has a median unemployment duration of 149 days, the age group 18-25 has a media of 248 days, the age group 25-30 year has a median of 250 days, the age group 30-40 has a median of 269 days, the age group 40-50 has a median of 298 days, the age group 50-60 has a median of 338 days and the age group 60 or more a median of 342 days.

Last, are plotted the survival functions for the different gender groups. The survival function estimates can be seen in Figure A 9. in the appendix. The differences in the probability of remaining unemployed between females and males do not appear to be significant. The slopes of the curves for men and women appear to coinciding almost all the

time in the observation period. The only difference in the slope of the curves appears in the period from 470 to 950 days (1,32 to 2,6 years), where there is a slightly higher probability of remaining unemployed for females than for males.

Finally the Kaplan-Meier results are validated by running the log-rank test. The null hypothesis of the test states that there are no significant differences between survival curves for different levels of the same covariate. For details on the definition of the log-rank test for interval censored data refer to Peto and Peto (1972) and Finkelstien(1986). The results are presented in Table 11. The p-values of all the covariates are significant. Thus the null hypothesis must be rejected for all regressors. This test validates the conclusions derived by looking at the plots of the survival function estimates. That is, there appear significant differences between different levels of the covariates: region; education; age and gender.

Table 11. Log-rank Test Estimates

Variable	Statistic	df	Significance
Gender	41,83	1	0,0000
Age	1887,06	6	0,0000
Education	1672,85	8	0,0000
Region	2989,58	29	0,0000

5.2 Cox Regression Results

The quantity λ_0 is the baseline hazard of the function defined in equation (9) in subsection 4.3. The baseline hazard describes the hazard rate of unemployment when all covariates are zero. The reference groups for the Cox estimation are male for sex; primary or no education for the variable education level; and Stip for the statistical region. Thus, in this case, the baseline hazard is the rate that refers to male individuals with primary or no education that live in the region of Stip.

The Cox regression analysis results are presented in Table 12. All the covariates turn to be significant estimates. The estimation yielded the following results.

From the hazard rates of the statistical regions can be concluded that unemployed individuals from Stip have higher probability to exit unemployment in the next short period compare to almost all regions. The only regions with higher hazard rates are: Radovis, Sveti Nikole, Makedonski Brod. These are towns in the Eastern parts of the country. During the observed period many new small textile factories were opened in the Eastern regions. This can explain the high hazard rates of these regions.

However, the rest of the observed regions have lower hazard rate compared to Stip. This means that the unemployed in the other statistical regions have lower probability to find a job in the next short period. The most worrisome is the situation in the western parts of the country. Gostivar (Region 10: Exp(B)= .489) and Tetovo (Region 28: Exp(B)=.541), which are towns in the Western region, have the lowest hazard rates. The low employment levels in these towns of can be attributed to the large grey sector.

When looking at the hazard rates for the education levels it is found that the hazard rate increases with the increase of the educational level. The only exception is the increase in

education level from bachelor to master's degree where the hazard rates for individuals with university degree is higher compared to the hazard rate for master's. Such pattern can signal either that the individuals with masters degree have significantly higher reservation wages compare or can be indicator for serious problems in the educational system in the country.

The hazard rates for gender suggests that male participants have 2.7% higher probability in exiting unemployment in the next short period, but there is not significant indicator for gender gap. Furthermore from the estimates can be concluded that the older the worker the lower is the probability that it will exit unemployment in the next period. The hazard is found to fall by 1.2% for each additional year of age.

Table 12. Cox's Proportional Hazard Esitimates

	B	SE	Wald	Df	Sig.	Exp(B)
Female	**-.027**	**.005**	**41.9812**	**1**	**.000**	**.968**
Age	**-.012**	**.000**	**3.582.769**	**1**	**.000**	**.985**
Region			**8.519.730**	**29**	**.000**	
Region1	-.018	.032	.573	1	.496	.986
Region2	.088	.009	58.020	1	.000	1.101
Region3	-.419	.029	188.793	1	.000	.589
Region4	.055	.018	8.9287	1	.002	1.061
Region5	-.391	.031	201.029	1	.000	.681
Region6	-.274	.019	137.895	1	.000	.758
Region7	-.303	.019	259.296	1	.000	.741
Region8	-.184	.029	40.007	1	.000	.798
Region9	-.004	.017	.081	1	.803	.989
Region10	-.716	.014	2.008.730	1	.000	.489
Region11	-.332	.018	378.120	1	.000	.721
Region12	-.302	.019	269.819	1	.000	.742
Region13	-.213	.020	197.637	1	.000	.808
Region14	-.407	.029	210.395	1	.000	.582
Region15	-.458	.019	568.042	1	.000	.633
Region16	-.287	.029	90.031	1	.000	.750
Region17	-.386	.009	970.951	1	.000	.701
Region18	-.091	.021	19.816	1	.000	.921
Region19	-.071	.022	22.031	1	.000	.942
Region20	-.339	.013	670.082	1	.000	.708
Region21	-.115	.019	36.010	1	.000	.901
Region22	.062	.016	14.908	1	.000	1.058
Region23	-.409	.028	212.508	1	.000	.671
Region24	-.269	.009	700.801	1	.000	.758
Region25	-.243	.018	240.075	1	.000	.803
Region26	-.316	.014	520.006	1	.000	.729
Region27	.081	.016	25.031	1	.000	1.084
Region28	-.549	.012	1.801.273	1	.000	.541
Region29	-.483	.018	959.892	1	.000	.618
education level			**7.201.856**	**8**	**.000**	
Level1	.150	.023	17.006	1	.000	1.148
Level2	.154	.018	4.877	1	.000	1.185
Level3	.209	.008	4.847	1	.000	1.241
Level4	.308	.006	2.829	1	.000	1.369
Level5	.372	.017	.249	1	.000	1.431
Level6	.598	.004	15.771	1	.000	1.840
Level7	.358	.075	.083	1	.000	1.421
Level8	.572	.363	2.478	1	.000	1.772

Finally, in order to test for the overall significance of the covariates it is run the omnibus test. The null hypothesis associated with the omnibus test is that: all covariates used in estimating the hazard rate are insignificant. ($H_0 : \beta_i = 0$). The results of the omnibus tests for the covariates of the Cox model are given in Table 12. The score chi-square statistic and the likelihood ratio statistic (given by -2 log likelihood) in Table 12. suggest that the null hypothesis should be rejected. This conforms the overall significance of the model.

Table 13. Omnibus Test of the Covariates

-2 Log Likelihood	Overall (score)		
	Chi-square	df	Sig.
5318658.953	21634.728	39	.000

6. Conclusion

This thesis considers the determinants of the duration of unemployment spells in Macedonia. The period under observation is between January 1st 20002 and December 31st 2005. The survival analysis based on the dataset obtained from the National Employment Agency, which includes 430,425 observations, yielded a number of interesting results.

In particular, labor participants from the Eastern regions have a higher probability of exiting unemployment compared to individuals from Western regions. The differences between the Kaplan-Meier survival function estimates for towns in the Westerns and Eastern regions are significant. The inequality across regions is reflected, as well, in the Cox's hazard rates estimates. The unemployed from the Western towns of Gostivar and Tetovo, for example, have a significantly lower chances of finding a job in the next short period compare to unemployed in Stip, a town in central Macedonia. These regional differences are reflection of the high level of grey economy in the Western regions.

The impact of the variable education is found to be significant, with an additional year of schooling translating into better prospects in the labor market. That is reflected by a higher probability of exiting unemployment. This does not hold for unemployed individuals with a Master's degree, however. It is found that he probability that the unemployment spell will end is lower for individuals with a Master's compared to individuals with a Bachelor's degree. This result may signal that unemployed individuals with a Master's degree have a significantly higher reservation wage than individuals with university education or that there are distortions in both the education system and the labor market in Macedonia. The results, as well, indicate that older workers have lower chances to exit unemployment, while there is no evidence in favor of the claim that there exist a gender gap.

Furthermore, even though the information from the research is limited, the analysis can provide important policy conclusions. That is, differences across regions; age groups; and different educational levels imply that employment policy needs to be targeted to more specific groups. For instance, one of the primary policy implications should be that long-term unemployment can be combated by ALMPs specifically targeted towards older workers; or to groups with no education and/or to unemployed from the Western towns.

The analysis of the research can be extended. Other questions that can be potentially covered in future research relate to the: (1)The relation between the duration of the activation program and the duration of unemployment/employment; (2) Assessments of the effectiveness of different ALMP ; (3) The effect of the duration on unemployment benefits on the length of the unemployment spells.

Appendix: Tables

Table A 1. Definitions: Labor Market Indicators

Labor Market Indicator	*Estimation*			*Description*
Active Population Rate (%)	(U + E)	÷	WAP	Share of working age population in the labor market
Employment Rate (%)	E	÷	WAP	Share of employed in the working age population
Unemployment Rate (%)	U	÷	(U+E)	Share of unemployed in the labor force
Inactivity Rate (%)	WAP – (U+E)	÷	WAP	Share of working age population **not** in the labor market
Joblessness Rate (%)	U + (WAP-U-E) – Enrolled	÷	WAP	Share of working age population not working, excluding those in the education system

- Working age population (WAP): is composed of individuals in the age group 15 to 80 years old. In 2004 the definition changed and now the population consists of individuals between 15 and 64.
- Labor force: is the sum of employed and unemployed individuals.
- Active population rate: is estimated as the total of the labor force over the total working age population.
- Employed (E): according to the SSO employed persons are considered those individuals who satisfy any of the following conditions: (1) the person did any work for at least one hour during the previous week (2) the person was "temporarily absent" from work because of holidays, illness, paid absence for education or training, maternity leave, strike, work dispute, seasonally work, etc.
- Unemployed(U): according to SSO unemployed individuals are those that: (1) were not working in the previous week; or (2) were actively looking for a job during the previous 4 weeks. The search is considered active if the person has done at least one of the following activities (the person can answer at most three searching activities): (i) Registered in the Employment Office; (ii) tried to start an activity as self-employed; (iii) contacted private employment agencies; (iv) placed advertisements; (v) answered advertisements; (vi) contacted employers directly; (vii) checked with relatives or friends; or (viii) participated in job tests/interviews; or (3) individuals who would be available to start a new job in the next two weeks if one were offered to him/her.

Table A 2. Regional Indicators of Regional Unemployment Variation

	Average	Minimum	Maximum	Coeff. of variation	Capital city region
Czech Republic	7.5	4.2	14.8	0.401	4.2
Hungary	6.3	3.3	11.3	0.311	3.6
Poland	20.1	8.5	33.4	0.258	18.3
Estonia	10.6	0.4	17.4	0.322	9.0
Latvia	10.4	8.2	15.4	0.227	10.8
Lithuania	12.3	7.5	16.9	0.204	11.7
Slovenia	7.3	4.7	10.2	0.298	4.7
Slovakia	17.2	7.1	23.9	0.363	7.1
Russia	8.0	1.4	44.0	0.563	1.4
Macedonia					
2004	38.0	23.7	59.8	0.281	32.3
2005	38.2	21.8	54.1	0.262	36.8
2006	36.3	16.6	57.7	0.345	37.6

Source: Huber (2006) and World Bank Estimates using 2004-2006 LFS data for Macedonia.

Table A 3. Features of the Unemployment Benefit system in Macedonia

Period of employments	Max. duration of benefits	Relation to individual's earnings
9 months to 18 months	1 month	50%
18 months to 2,5 years	2 months	50%
2,5 years to 5 years	3 months	50%
5 years to 7,5 years	4 months	50%
7,5 years to 10 years	5 months	50%
10 years to 12,5 years	6 months	50%
12,5 years to 15 years	7 months	50%
15 years to 17,5 years	8 months	50%
17,5 years to 20 years	9 months	50%
20 years to 22,5 years	10 months	50%
22,5 years to 25 years	11 months	50%
25 years	12 months	50%

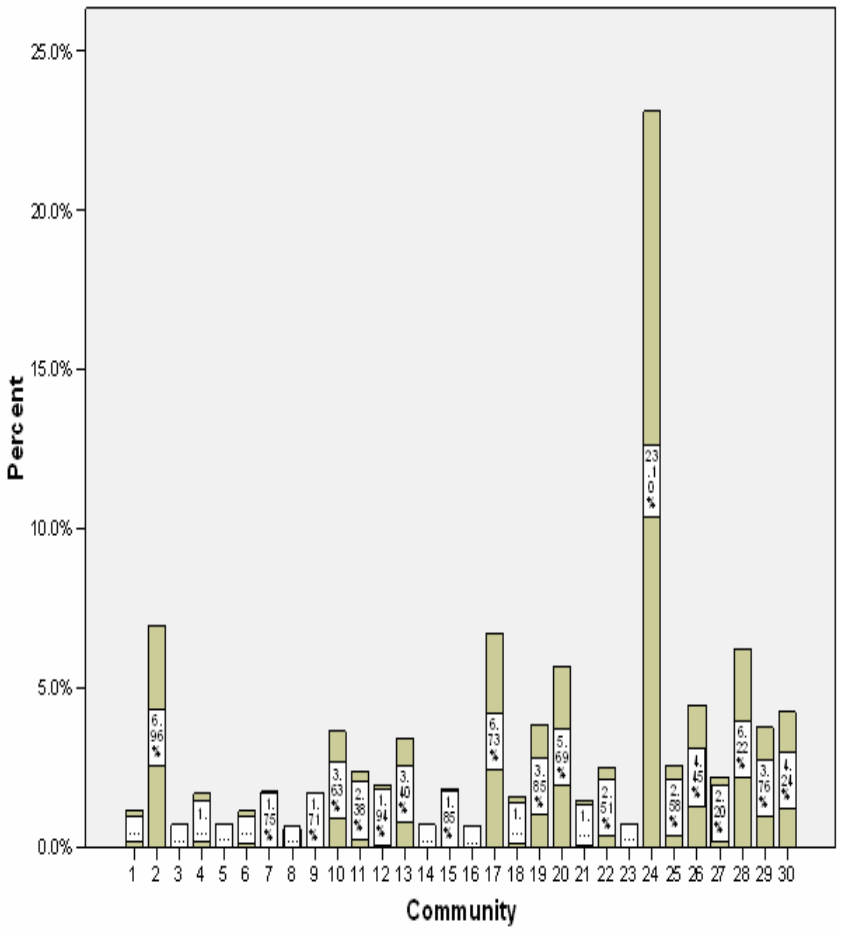
Table A 4. Main Features of Unemployment Benefit Systems in CEE

	Date	Reference period	Requiered min employment record	Max duration of benefits	Relation to individual's gross earnings
Bulgaria	1998	12 months	9 months	12 months	60%
Czech R.	1998	3 years	12 months	6 months	50% first 6 months, 40% next 6 months
Estonia	2003	24 months	12 months	12 months	50% first 100 days 40% next period
Hungary	1997	4 years	90 days	360 days	60%
Romania	1998	1 year	1 year	9 months	50-60%
Slovak R.	1997	3 years	12 months	12 months	60% first 3 months 50% next 9 months
Slovenia	1998	18 months	9-12 months	24 months	70% first 3 months 60% next 3 months

Source: Vodopivec et al (2003)

Appendix: Figures

Figure A 1. Unemployment Rates Across the 30 Statistical Regions



REGION1	Berovo
REGION2	Bitola
REGION3	Makedonski Brod
REGION4	Vinica
REGION5	Valandovo
REGION6	Debar
REGION7	Delcevo
REGION8	Demir Hisar
REGION9	Gevgelija
REGION10	Gostivar
REGION11	Kavadarci
REGION12	Kicevo
REGION13	Kocani
REGION14	Kratovo
REGION15	Kriva Palanka
REGION16	Krusevo
REGION17	Kumanovo
REGION18	Negotino
REGION19	Ohrid
REGION20	Prilep
REGION21	Probistip
REGION22	Radovis
REGION23	Resen
REGION24	Skopje
REGION25	Struga
REGION26	Strumica
REGION27	Sveti Nikole
REGION28	Tetovo
REGION29	Veles
REGION30	Stip

Figure A 2. Histogram of the Unemployment Spells

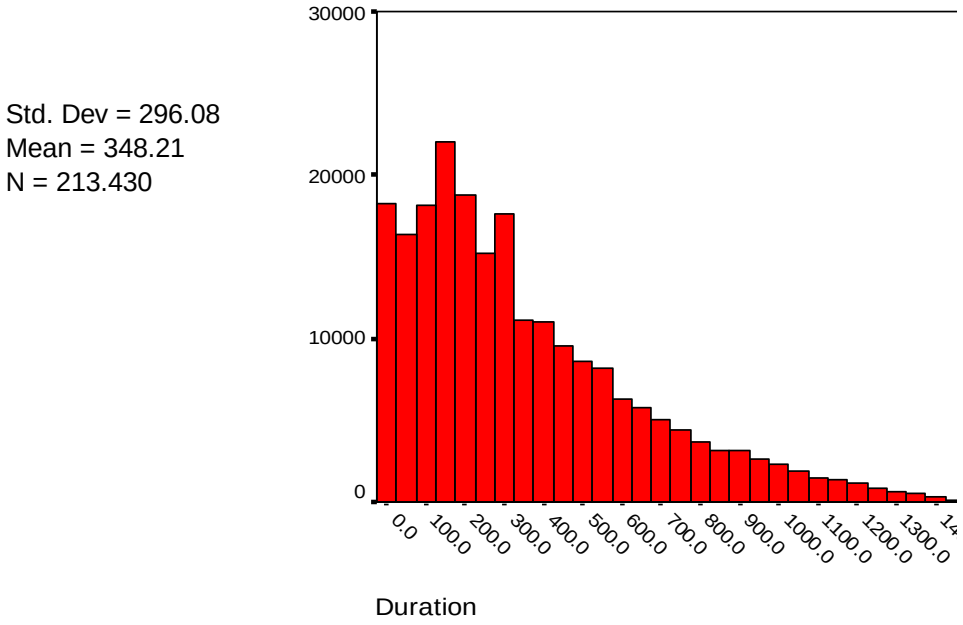


Figure A 3. Histogram of the Age of the Unemployed

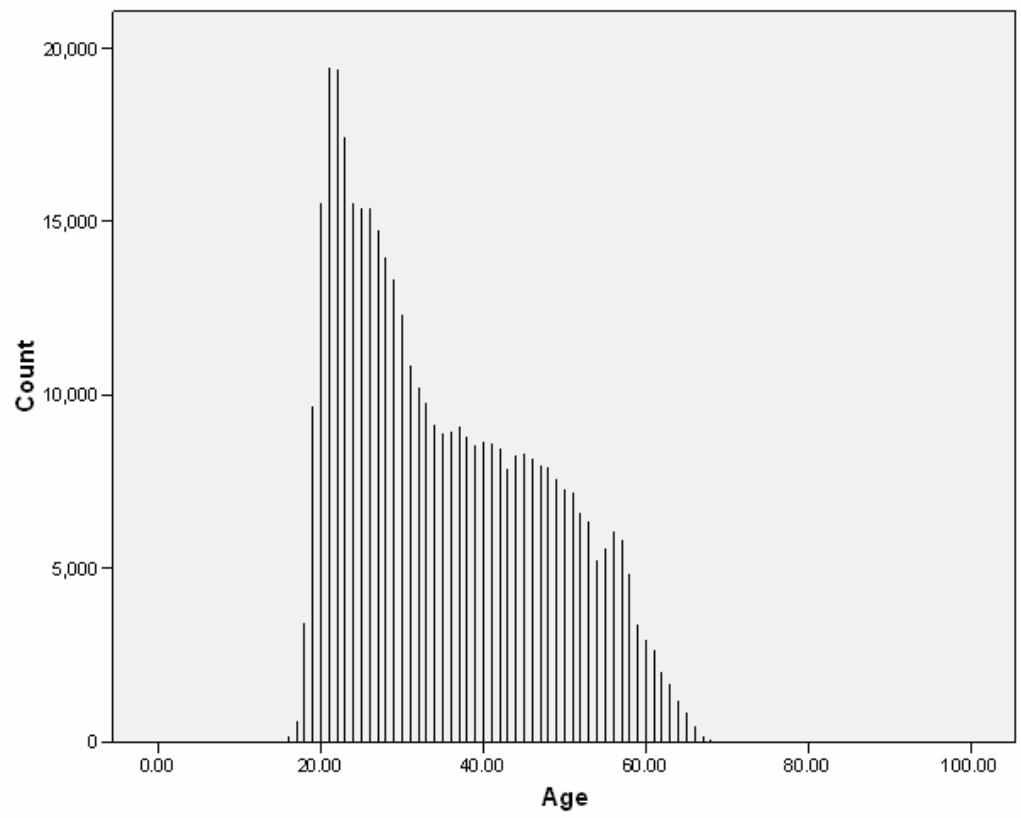
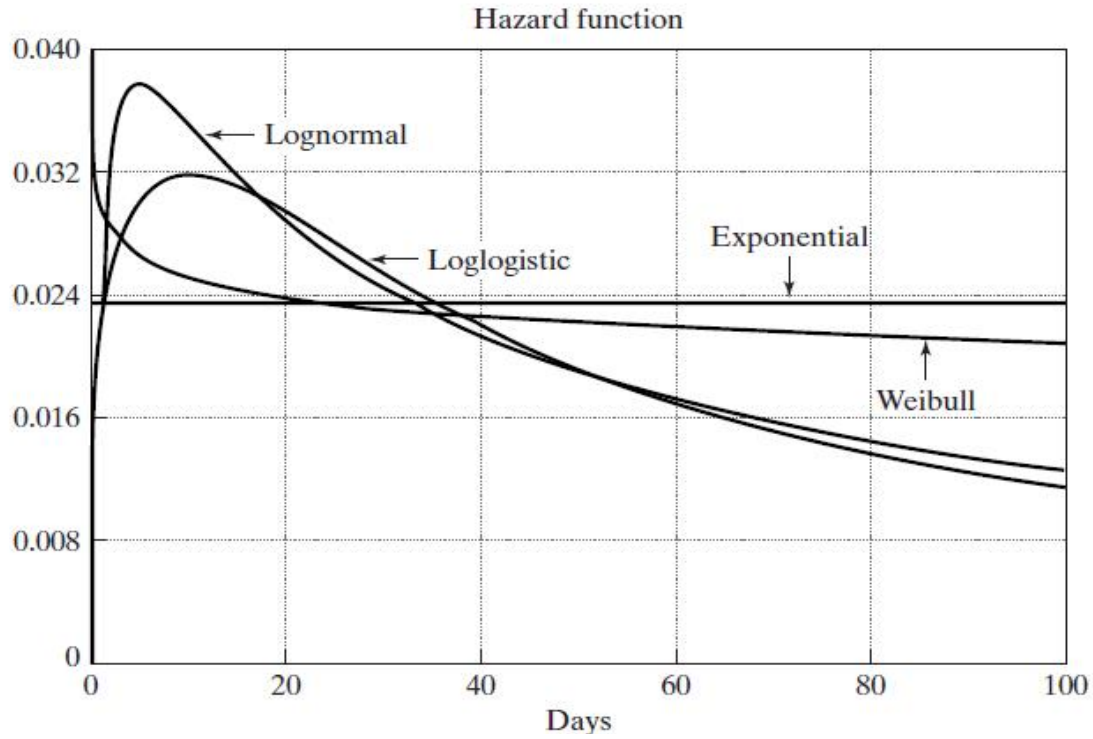


Figure A 4. Parametric Hazard Functions



Source: Greene (2008)

Figure A 5. Kaplan-Meier Survival Function for University Level and Advanced Training

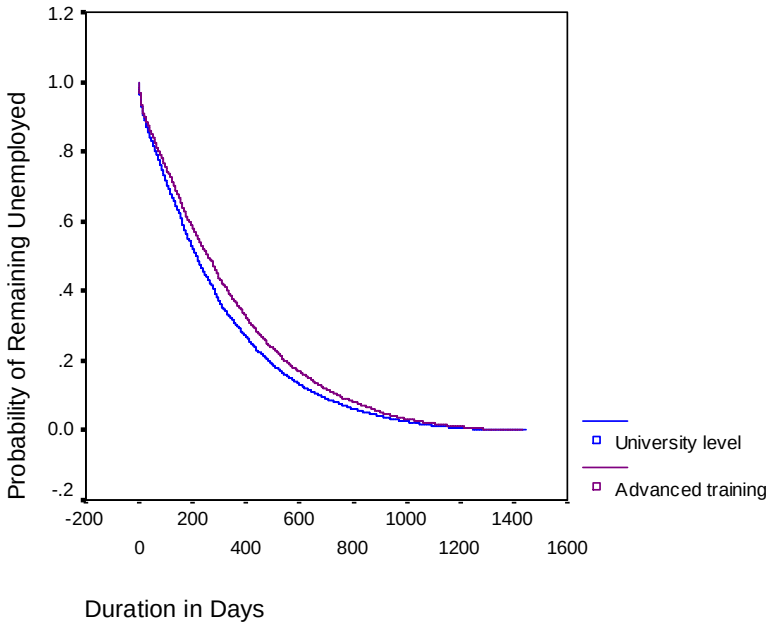


Figure A 6. Kaplan-Meier Survival Function for Advanced Training; Four Years Secondary; Three Years Secondary and no Education

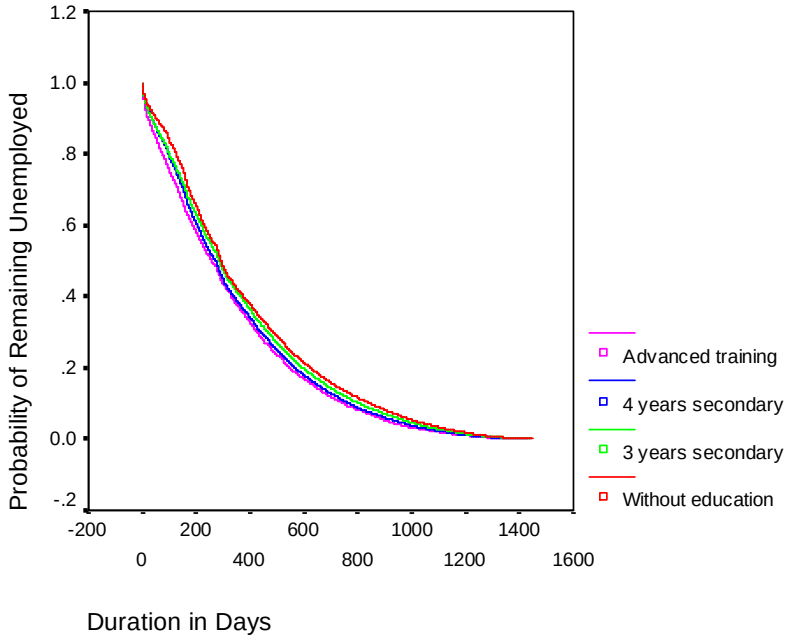


Figure A 7. Kaplan-Meier Survival Function for University Level, Master's Degree and Doctorate

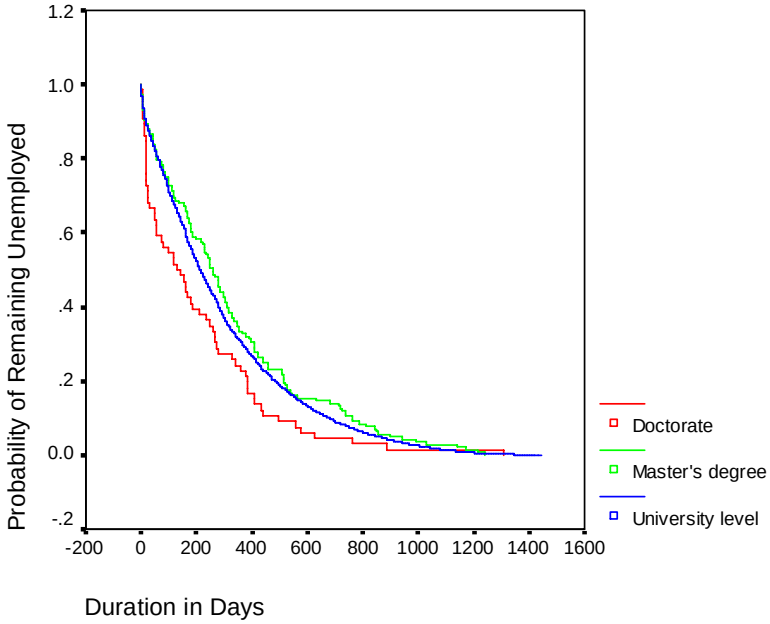


Figure A 8. Kaplan-Meier Survival Function for Different Age Groups

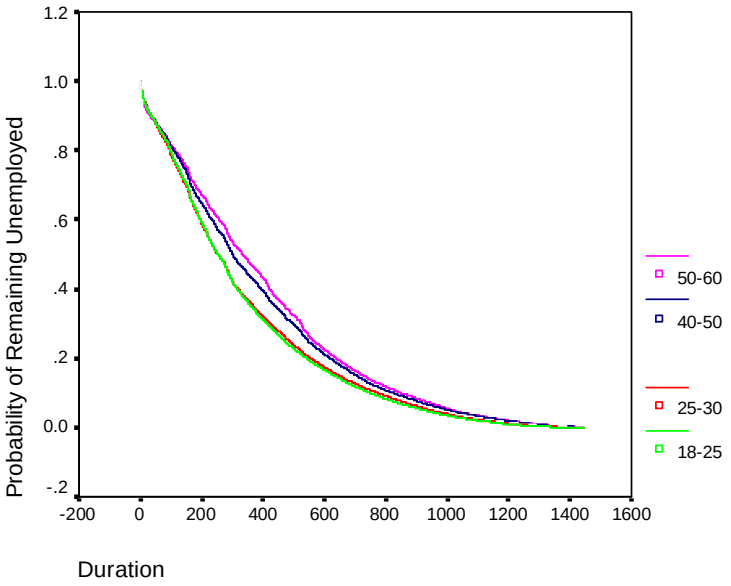
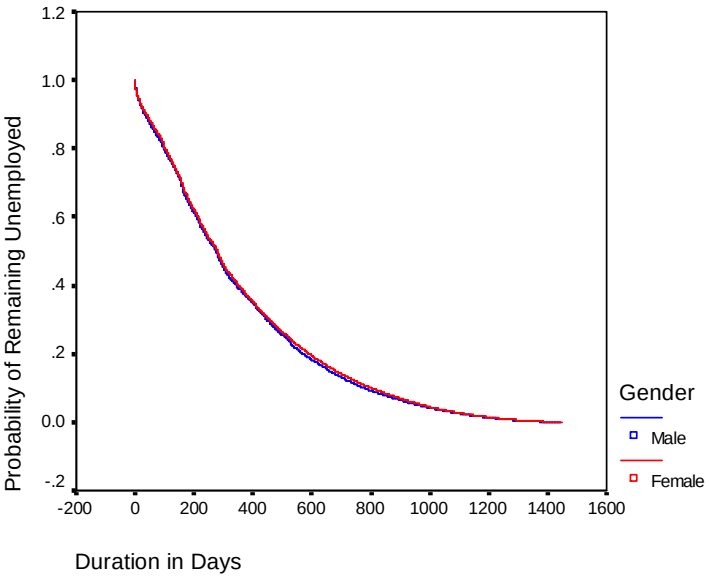


Figure A 9. Kaplan-Meier Survival Function for Sex



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